Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	
Unlicensed Use of the 6 GHz Band	ET Docket No. 18-295
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz	GN Docket No. 17-183

REPLY COMMENTS OF INTELSAT LICENSE LLC AND SES AMERICOM, INC.

Intelsat License LLC ("Intelsat") and SES Americom, Inc. ("SES") hereby submit these Reply Comments regarding the above-captioned Notice of Proposed Rulemaking ("NPRM").[1] As the initial Intelsat and SES comments emphasize, the 5.925-7.125 GHz ("6 GHz") band is heavily populated by numerous licensed incumbents, including the Fixed-Satellite Service ("FSS"), and introducing a new service in this congested band, even on a non-interference basis, is much more complicated than unlicensed advocates make it out to be.[2] This complexity has incumbents rightfully concerned about the future of their services.[3] If the Federal

[1] *Unlicensed Use of the 6 GHz Band; Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Proposed Rulemaking, FCC 18-147 (rel. Oct 24, 2018) (the "NPRM"). The Commission has proposed an Unlicensed National Information Infrastructure ("U-NII") nomenclature for the 6 GHz band, which will be used throughout these comments. The sub-bands are: U-NII-5: 5.925-6.425 GHz; U-NII-6: 6.425-6.525 GHz; U-NII-7: 6.525-6.875 GHz; and U-NII-8: 6.875-7.125 GHz. *See id.* at ¶ 21.

[2] Comments of Intelsat License LLC and SES Americom, Inc., ET Docket No. 18-295 and GN Docket No. 17-183 (filed Feb. 15, 2019) ("Intelsat and SES") at 2-8. Unless otherwise specified, all citations herein are to comments filed on February 15, 2019 in ET Docket No. 18-295 and GN Docket No. 17-183.

[3] *See e.g.*, Comments of APCO International; Comments of AT&T Services Inc. ("AT&T"); Comments of the City of Austin, Texas ("Austin, Texas"); Comments of Nokia ("Nokia").

Communications Commission ("FCC" or "Commission") permits unlicensed use of 6 GHz, the agency must adopt rules that adequately protect incumbent services—even if this results in a less flexible, less than ideal outcome for potential unlicensed uses and users.[4]

In order to ensure that FSS networks are protected, the Commission must impose an aggregate power limit on unlicensed devices to be enforced by a robust automated frequency coordination ("AFC") system.[5] The FCC should also reject proposals for additional licensed use of FSS spectrum in the 6 GHz band.

I. THE RECORD HIGHLIGHTS THE NEED FOR AN AGGREGATE POWER LIMIT IMPLEMENTED BY AN AFC

A. Aggregate Interference from Unlicensed Operations Will Cause Harmful Interference into Satellite Receivers

As discussed in the Intelsat and SES Comments, claims that FSS would not be adversely affected by aggregate interference are based on faulty assumptions and flawed analyses.[6] The most recent submissions by a group of unlicensed radio local access network ("RLAN") proponents[7] and the Wi-Fi Alliance[8] do nothing to cure these defects.

The RLAN group contends that due to FSS uplink characteristics, "RLAN operations pose no risk of harmful interference to these operations, especially when compared to the high-

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[4] It is also possible that sharing with unlicensed devices may not be possible in some or all of the 6 GHz band. The National Association of Broadcasters ("NAB") points out that the proposals in the NPRM fail to adequately protect the incumbent broadcast auxiliary services ("BAS"). *See* Comments of NAB at 9-14 ("NAB"). The Commission should not introduce new unlicensed operations in a band without sufficient protection mechanisms for all incumbents.

[5] Intelsat and SES at 8-14.

[6] *Id.* at 6-12.

[7] *See* Comments of Apple Inc., Broadcom Inc., Cisco Systems Inc., Facebook, Inc., Google LLC, Hewlett Packard Enterprise, Intel Corporation, Marvell Semiconductor, Inc., Microsoft Corporation, Qualcomm Incorporated, and Ruckus Networks, an Arris Company ("RLAN Group").

[8] *See* Comments of Wi-Fi Alliance at 36 ("Wi-Fi Alliance").

power [Fixed Service ("FS")] links that already operate in the band."[9] The companies also argue that there is no need for aggregate protections for satellite uplink operations in the 6 GHz band because a study previously submitted by these entities[10] shows that "the peak energy that an FSS receiver might receive from 6 GHz RLAN operations would be a small fraction of what it already receives today from licensed FS links."[11] The Wi-Fi Alliance alleges that "significant separation distances between ground-based U-NII transmitters and space-based satellite receivers provide ample isolation to mitigate against the potential of aggregate harmful interference,"[12] eliminating the need to monitor aggregate interference.[13] The Commission must disregard these unfounded claims, and determine that unlicensed devices pose a very real risk to FSS operations in the 6 GHz band.

First, the RLAN Group's comparison between FS links and unlicensed devices is fundamentally misleading. While FS links in 6 GHz are at higher power than the proposed unlicensed use limits, FS links are a primary service, highly directional, coordinated with FSS, and will almost certainly never reach the deployment numbers that unlicensed devices will. In contrast, unlicensed devices must operate on a non-interference basis, will likely be omnidirectional, will not be coordinated with existing FSS networks prior to operation, and are predicted to have deployment numbers in the hundreds of millions or even billions.[14] Second, as

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9 RLAN Group at 5.

10 *See* Frequency Sharing for Radio Local Area Networks in the 6 GHz Band, prepared by RKF Engineering Services, LLC, Attachment to *Ex Parte* Filing of Apple Inc. *et al*., GN Docket No. 17-183, filed Jan. 25, 2018 ("RKF Report").

11 RLAN Group at 47.

12 Wi-Fi Alliance at 36. *See also* Comments of CTIA at 12-13 ("CTIA").

13 Wi-Fi Alliance at 36-37.

14 *See* NPRM at ¶¶ 6-7.

several commenters point out, the RKF Report on which the RLAN Group relies has "drawn significant criticism regarding its methodology, assumptions, conclusions, and completeness."[15] For example, the study inappropriately disregards smaller beams when selecting a G/T value for FSS interference analysis.[16] RKF's G/T cherry-picking results in a model that fails to depict real-world FSS operations and cannot be relied on to allay concerns of harmful aggregate interference to satellite receivers from unlicensed devices.

Contrary to the Wi-Fi Alliance's claims, "significant separation distances"[17] will not protect FSS from harmful interference due to unrestrained unlicensed device deployment in the 6 GHz band—as is evidenced by the issues experienced by Globalstar in the UNII-1 frequencies.[18] As Intelsat and SES have previously explained, signals to geostationary orbit ("GSO") spacecraft "are weaker on arrival at the satellite receiver than those at Globalstar's receivers, and GSO coverage areas are much larger" than those of Globalstar's low Earth orbit satellites.[19] As a result, GSO satellite operations are similarly "susceptible to interference caused by simultaneous transmissions from what could be hundreds of millions of unlicensed devices" scattered across the contiguous United States.[20] Regardless of distance from the Earth, and

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15 AT&T at 5 & n.6; *see also* Intelsat and SES at 7-8; *Ex Parte* Filing of Intelsat and SES, GN Docket 17-183 (Feb. 23, 2018); Comments of Decawave at § 3.5 ("Decawave"); Fixed Wireless Communications Coalition, Inc. Comments at 11-22 ("FWCC"); NAB at 5-8; Comments of Society of Broadcast Engineers at ¶¶ 6, 12; Comments of Utilities Technology Council *et al*. at 10 ("UTC") (the RKF Report is "rife with factual deficiencies").

16 Intelsat and SES at 10.

17 Wi-Fi Alliance at 36.

18 *See* Intelsat and SES at 6-7; Comments of Globalstar at 11 ("Globalstar"); Comments of Sirius XM at 10.

19 Intelsat and SES at 6.

20 *Id*.

regardless of device characteristics, after reaching a certain deployment density level unlicensed devices will cause harmful aggregate interference into satellite receivers.

The Wi-Fi Alliance's analysis also relies on a number of inaccurate or unfounded assumptions. The FSS characteristics it uses do not reflect the most sensitive FSS satellites in operation today, much less account for more sensitive future satellites. Moreover, the analysis is based on predictions regarding duty cycle, transmit power levels, busy hour factor, market factor, and indoor/outdoor use ratio that are either not present in the proposed rules or not reflective of the rules. For example, the NPRM proposes to allow only outdoor use in the UNII-5 band at a power of 1 watt, yet the Wi-Fi Alliance assumes in its calculations that only 2% of devices per channel will be outdoors and that these devices will operate at just 1.5 milliwatts.[21] The Commission should reject the conclusion of this analysis because it fails to even remotely reflect the current FSS use of the band and the Commission's proposed parameters for U-NII operations.

B. The Number of Unknown Variables in the Record Highlights the Need for an Aggregate Interference Limit

The record includes a number of technical analyses undertaken by both supporters and opponents of unlicensed 6 GHz use.[22] Because the NPRM did not propose limits on certain operational parameters and utilization characteristics for unlicensed devices, including variables

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21 Wi-Fi Alliance, Annex at 2-3.

22 *See* RLAN Group; Comments of Broadcom Inc. ("Broadcom"); Comments of Comsearch; Decawave; Comments of Encina Communications Corporation; Comments of Engineers for the Integrity of Broadcast Auxiliary Service Spectrum; FWCC; Globalstar; Comments of Hewlett Packard Enterprise Company; NAB; Comments of National Spectrum Management Association; Comments of Midcontinent Communications; Comments of Netgear, Inc.; Nokia; Comments of Qualcomm Incorporated ("Qualcomm"); Comments of Rignet Satcom, Inc.; Comments of The Ultra Wide Band Alliance; UTC; Comments of Viaero Wireless; Wi-Fi Alliance.

such as duty cycle and deployment density, each commenter assumed values for these variables in order to run a model. For example, Decawave undertook an interference analysis similar to the RKF Report, but increased the percent of devices transmitting at high power levels since most outdoor devices do not exercise transmit power control.[23] Nokia submitted a technical analysis that illustrated several unlicensed deployment scenarios, both indoor and outdoor.[24] The varying assumptions and modeling results reflected in the record provide a multitude of predicted snapshots of what unlicensed deployment *could* look like, but provide no certainty regarding how deployment in the band will actually unfold.

The Commission, however, cannot establish a regulatory regime under which the protection of incumbent licensees is dependent on inherently speculative assumptions regarding unlicensed operations. SES and Intelsat understand the Commission's reluctance to impose limits on the operating characteristics of unlicensed devices that could constrain their evolution. But maximizing opportunities for innovation by Part 15 devices that are permitted to operate only on a non-harmful interference basis,[25] cannot come at the expense of incumbent licensed users. For coexistence to occur, unlicensed development must happen within limitations that fully safeguard incumbents' current and future operations.

Further, the RLAN Group and others seek authority to operate client devices at the same power levels as the associated access points.[26] CTIA even suggests adopting higher power levels

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23 Decawave at 10-11. Intelsat and SES agree with Decawave that the power distribution assumptions used in the RKF Report are highly questionable.

24 *See* Nokia, Technical Appendix.

25 *See* 47 C.F.R. § 15.5 (b).

26 *See, e.g.,* RLAN Group at 49; Broadcom at 3; Comments of Charter Communications Inc. at 4; Qualcomm at 16; Wi-Fi Alliance at 17.

for all outdoor operations.[27] Increasing radiated power levels for client devices or all devices, however, would significantly impact the potential interference into satellite receivers because there is a finite volume of tolerable aggregate interference. Permitting client devices to operate at the same power as their associated access points would decrease the overall number of devices that could operate per channel before causing aggregate interference into the satellite receiver.

Intelsat and SES proposed a concrete solution to limit aggregate interference into FSS receivers from unlicensed devices that is not dependent on any of the variables in the record—the adoption of a maximum cap on the aggregate equivalent isotropically radiated power ("EIRP") of 19.7 dBW per channel.[28] This approach is technology neutral and does not require the Commission to limit the number, duty cycle, or deployment scenarios for unlicensed devices and provides maximum flexibility for innovation and use by unlicensed devices. Ultimately there is a finite number of unlicensed devices that can operate simultaneously on a given channel before aggregate interference into FSS becomes an issue. However, under the Intelsat and SES proposal, that number is determined by the actual operating parameters and deployment of devices as determined by unlicensed users. Depending on how unlicensed use of the 6 GHz band evolves, the 19.7 dBW cap per channel may never be met or may be met soon after unlicensed deployment. By adopting an aggregate interference cap, the Commission can proactively avoid unlawful interference before it occurs while still providing maximum flexibility to unlicensed devices *vis-à-vis* FSS operations.

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27 CTIA at 20.

28 *See* Intelsat and SES Comments at table, p. 11.

C. The AFC Must Be Capable of Ensuring that Unlicensed Devices Do Not Cause Harmful Interference into Licensed Services

Given the varied and intensive existing licensed use of the 6 GHz band, determining whether a proposed unlicensed operation can occur without causing harmful interference into incumbents will necessarily be complex. While Intelsat and SES agree with Apple Inc. ("Apple") that the AFC "should ensure strong protection for incumbents, but should not impose unneeded or technologically specific constraints that will suppress investment and discourage innovation,"[29] the companies differ greatly on what is needed. Apple, like most unlicensed advocates, asks the Commission to create a very simple AFC.[30] These parties oppose requirements that Intelsat, SES, and other incumbents believe are necessary to protect licensed, primary 6 GHz band operations, such as a centralized AFC and device registration and identification. Similarly, some commenters also want to be able to use low-power unlicensed devices outside without AFC system.[31] The Commission's focus, however, must be on preventing harmful interference from unlicensed devices into 6 GHz incumbent services.[32] Achieving that objective requires a robust and comprehensive AFC system that can successfully control unlicensed device deployment in order to prevent interference from arising, as well as

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29 Comments of Apple at 20.

30 *See, e.g., id*. at 11-13; Comments of Facebook at 9-10 ("Facebook"); Comments of Microsoft at 15-21.

31 *See, e.g.,* RLAN Group at 35; Facebook at 5-6.

32 "[T]he Commission should mandate that all AFC systems be designed to monitor and limit the aggregate interference into FSS receivers … caused by *outdoor* unlicensed devices into licensed services." *See* SES and Intelsat at 12 (emphasis added). Many other incumbents state in their comments that low-powered indoor devices should also be included in the AFC. *See, e.g.*, Austin, Texas at 2-3; Nokia at 4. While Intelsat and SES believe that indoor use will have a negligible effect on aggregate interference into FSS, if the inclusion of indoor devices in the AFC is necessary to protect other incumbents in the 6 GHz band, then the Commission should mandate that all unlicensed devices operate under the authority of an AFC system.

resolve interference if it nevertheless occurs by requiring termination of the harmful unlicensed device transmissions.

II. THE FCC SHOULD NOT INTRODUCE ADDITIONAL LICENSED USE OF THE 6 GHz BAND

The Commission should dismiss CTIA's request that the Commission adopt a Further Notice to consider whether to repurpose the upper portion of the 6 GHz band for exclusive use, flexible-rights licensing.[33] The 6 GHz band is heavily used by a variety of licensed incumbents,[34]and the Commission is looking to further optimize use of the band with the introduction of unlicensed users. CTIA's proposal not only ignores the issue of aggregate interference,[35] but also fails to recognize the importance of this heavily-used band to licensed incumbents. Aggregate interference can be caused by any terrestrial use—there is nothing different about CTIA's proposed licensed use that would make satellite receivers immune to aggregate interference. Further, CTIA proposed that FS, BAS, and Cable Television Relay Services ("CARS") all be relocated in favor of terrestrial wireless services,[36] but notably does not identify any spectrum in which these users could be accommodated.

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33 CTIA at 7-13; *see also* Ericsson Comments at 8-16.

34 *See* NPRM at ¶¶ 2, 8-12. The band is already congested, as evidenced by AT&T's issues in coordinating new microwave paths. *See* AT&T at 7 ("due to the high level of congestion in the 6 GHz band among point-to-point licensees, AT&T already experiences difficulty in coordinating its own microwave paths"). The same difficulties affect FSS operators—Intelsat recently experienced challenges in coordinating new telemetry, tracking, and command ("TT&C") transmissions on an existing antenna because of conflicts with a microwave antenna 45 miles away.

35 CTIA at 13 (asserting that "terrestrial operations would not interfere with the operation of the distant satellite").

36 *Id*. at 10-13.

As the record clearly indicates, incumbents in the 6 GHz band are diverse and provide an equally diverse set of services,[37] including public safety services. This band is an example of efficient spectrum sharing, and the reallocation of any part of it to exclusive, flexible-rights licensing would be harmful to incumbents and a misuse of the resource.

III. CONCLUSION

For the reasons stated above, Intelsat and SES urge the Commission to adopt their proposed aggregate power limit and implement rules that create a robust AFC system. Further, the Commission should decline to consider reallocation of any portion of the 6 GHz band for new licensed operations.

Respectfully submitted,

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[37] Incumbents that filed comments in response to the NPRM include municipalities, public safety groups, broadcasters, large telecommunication companies, and public utilities. As the Commission has acknowledged, the 6 GHz band is used for a wide range of services such as FSS, fixed point-to-point microwave services, BAS, and CARS. *See* NPRM at ¶¶ 8-9.